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REMOVAL OF AMMONIUM AND SODIUM IONS FROM GROUNDWATER

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Introduction

In the Republic of Moldova, groundwater is polluted with various organic and inorganic pollutants. The most common pollutants, present in almost all groundwater, are ammonium and sodium ions and ammonia. In order to remove these pollutants from the water of the artesian well in the village Inesti, district Telenesti, we used the H-cationite Amberlite IR 120 to remove the Na^+ ions and subsequently treated the water with calcium hypochlorite, to oxidize the ammonia and ammonium anions.
The aim of this work is to study the possibility of simultaneous removal of ammonium and sodium ions and ammonia from the groundwater in Inesti, using physico-chemical methods.

Materials and methods

In this study we used the NA-form of the cationite KY-2-8, which was modified into the H-form by column treatment with 2mol/L HCl. Further, the demineralized water was filtered through the treated column for a complete removal of chlorine ions. Thus, the cationite column KY-2-8 H-form was prepared for the following step, i.e. the removal of sodium ions from the analyzed water. The H-cationite Amberlite IR 120 available from SIGMA ALDRICH was also used. The concentration of sodium ions was measured using the AAS-1 spectrophotometer. The cationite column dimensions were the following: height (h) – 235 mm, diameter – 20 mm. Water filtration velocity – 2 mL/min.

Results and conclusions

The concentration of Ca^{2+}, Mg^{2+} and Mn^{2+} ions in the water from the artesian well in the Inesti village, district Telenesti, was determined 8.0 mg/L, 12 mg/L and 0.02 mg/L, respectively. The total content of ammonia and ammonium ions in the studied well water was 3.49mg/L, which exceeded by far the maximum allowable concentration in the current regulation. The pH value was 7.5, suggesting that a very small amount of ammonia was actually present in the water, which contained mostly ammonium ions. The initial concentration of Na^+ ions was 329 mg/L.
The break-through curves of sodium ions on these H-cationites showed the possibility of removal of sodium ions from the analyzed water samples.
After treatment, the concentrations of Ca^{2+}, $Mg^{2+,}$ and $Mn2^+$ ions were equal to zero, and the amounts of ammonium and sodium ions were below the maximum allowable concentrations.

The average pH value of the entire water volume filtered through the H-cationite was 2.5. Following the subsequent water treatment with calcium hypochlorite and pH correction with HCl, the pH value corresponded to the standards for drinking water in the Republic of Moldova.

On the basis of obtained results we suggest the following technological scheme for the removal of ammonium and Na^+ ions and ammonia, present in the water from the artesian well in the Inesti village, district Telenesti (Figure 1), which consists of the H-cationite column, reactor with mixer, and calcium hypochlorite doser.

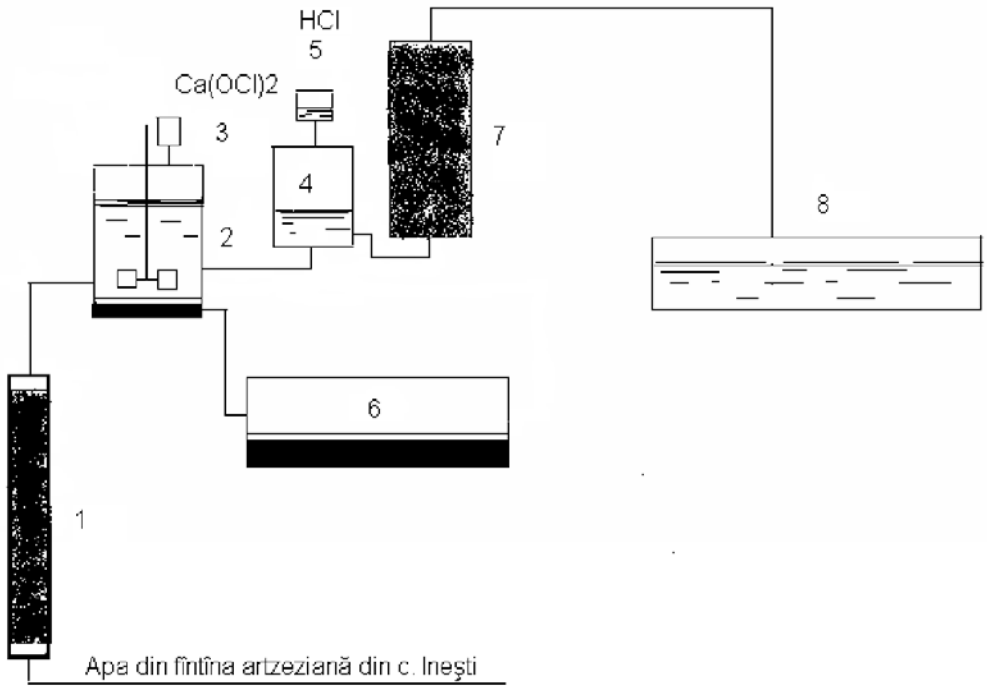

Figure 1. Technological scheme for obtaining drinking water from the water in the artesian well in the Inesti village, district Telenesti. 1 – column with H-cationite Amberlite IR 120, 2 – reactor with mixer, 3 – calcium hypochlorite dozer, 4 – reactor, 5 – HCl dozer, 6 – precipitate accumulation vessel, 7 – fractionated sand column, 8 – pure water accumulation vessel